CLAIMS

What is claimed is:

1. A method for producing power to drive a load using a working fluid circulating through a system that includes a prime mover having an inlet, an accumulator containing discharge fluid from the prime mover, the method comprising the steps of:

expanding a high velocity stream of heated vaporized fluid at relatively high pressure through the prime mover to a lower pressure discharge side of the prime mover where discharge fluid exits the prime mover;

vaporizing the discharge fluid by passing the discharge fluid through an expansion device across a pressure differential to a lower pressure than the pressure at the prime mover discharge side;

transferring latent heat of condensation from discharge fluid being discharged from the prime mover to the discharge fluid that has passed through the expansion device;

heating and vaporizing discharge fluid to which heat has been transferred from fluid being discharged from the prime mover; and

returning the heated vaporized fluid to the prime mover inlet.

2. The method of claim 1, further comprising:

maintaining the prime mover discharge at the relatively lower pressure by pumping vaporized discharge fluid discharged from the prime mover and contained in an accumulator to the prime mover inlet.

3. The method of claim 1, further comprising:

maintaining the prime mover discharge at the relatively low pressure by pumping liquid discharge fluid discharged from the prime mover and to a heat exchanger.

4. The method of claim 1, wherein the step of vaporizing the discharge fluid by passing discharge fluid through an expansion device across a pressure differential, further comprises:

arranging an expansion device having an intake side and an outlet side such that the intake side communicates with the discharge side of the prime mover and the outlet side communicates with a compressor inlet; and

using the compressor to produce a relatively lower pressure at the expansion device outlet side than a pressure at the expansion device intake side.

5. The method of claim 1, wherein the step of vaporizing the discharge fluid by passing discharge fluid through an expansion device across a pressure differential, further comprises:

reducing a temperature of the discharge fluid that has passed through the expansion device to a temperature lower than the temperature of fluid being discharged from the prime mover;

causing the discharge fluid that has passed through the expansion device to to flash boil and extract latent heat of condensation from the discharge fluid being discharged from the prime mover.

6. The method of claim 1, wherein the step of vaporizing the discharge fluid by passing discharge fluid through an expansion device across a pressure differential, further comprises expanding the discharge fluid isobarically.

7. The method of claim 1, further comprising:

producing the high velocity fluid stream by passing the heated vaporized fluid through a convergent-divergent nozzle across a pressure differential.

8. The method of claim 1, further comprising:

scavenging vaporized discharge fluid that has passed through the expansion device;

compressing the scavenged discharge fluid; and

returning the heated vaporized fluid to the prime mover inlet.

9. The method of claim 1, further comprising:

supplying the system with a working fluid having a positive Joule-Thompson coefficient over a range of system operation.

10. The method of claim 9, further comprising:

supplying the system with a working fluid that is refrigerant 134-a.

11. The method of claim 1, further comprising the steps of:

pumping liquid discharge fluid from the discharge side of the prime mover to a heat exchanger;

heating and vaporizing discharge fluid pumped from the discharge side of the prime mover using the heat exchanger and a heat source; and

returning the heated vaporized discharge fluid from the heat exchanger to the prime mover inlet.

12. The method of claim 11, wherein the step of heating and vaporizing discharge fluid pumped from the discharge side of the prime mover using the heat exchanger and a heat source, further comprises:

using as the heat source one of ambient air and process cooling water.

13. The method of claim 11, further comprising the steps of:

heating and vaporizing at least a portion of the liquid discharge fluid that is pumped from the discharge side of the prime mover using a heat source; and

supplying the heated vaporized discharge fluid to the prime mover inlet.

14. The method of claim 1, further comprising the steps of:

pumping vaporized discharge fluid that has passed through the expansion device to the prime mover inlet; and

transferring heat to a heat source from at least a portion of the vaporized discharge fluid that has passed through the expansion device.

15. A system for generating power using a fluid in which energy is stored and removed, comprising:

a prime mover for driving a load, having an inlet and discharge side, though which prime mover heated vaporized fluid at relatively high pressure is expanded to a lower pressure at the discharge side where discharge fluid exits the prime mover;

an accumulator containing discharge fluid from the prime mover;

a boiler for heating and vaporizing discharge fluid from the prime mover; and

a device for pumping from the accumulator to the boiler vaporized discharge fluid discharged from the prime mover; and

a pump for delivering liquid fluid from the accumulator to the boiler.

16. The system of claim 15, further comprising:

an expansion device for vaporizing discharge fluid from the prime mover by passing the discharge fluid through the expansion device across a pressure differential to a lower pressure than a pressure at the prime mover discharge side;

a first heat exchanger for transferring latent heat of condensation from the discharge fluid discharged from the prime mover to the discharge fluid that has passed through the expansion device; and

wherein the pumping device pumps to the boiler vaporized discharge fluid fluid that has passed through the expansion device and first heat exchanger.

17. The system of claim 15, wherein the prime mover is any of a disk turbine, a blade turbine, a centrifugal turbine, a vane motor, and a piston motor.

18. The system of claim 15, wherein the device for pumping is any of a compressor and a blower.

19. The system of claim 15, wherein the fluid has a positive Joule-Thompson coefficient in the range of system operation.

20. The system of claim 15, wherein the fluid is refrigerant 134-a.

21. The system of claim 15, further comprising:

a heat sink; and

a second heat exchanger for transferring heat to the heat sink from the vaporized discharge fluid pumped from the accumulator by the pumping device.

22. The system of claim 15, further comprising:

a heat sink;

a second heat exchanger for transferring heat to the heat sink from the vaporized discharge fluid pumped from the accumulator by the pumping device; and

a fluid line for carrying to the accumulator fluid that has passed through the second heat exchanger.

23. The system of claim 15, further comprising:

a heat sink; and

a second heat exchanger for transferring heat to the heat sink from the vaporized discharge fluid that has passed through the expansion device and first heat exchanger.

24. The system of claim 15, further comprising:

a heat sink; and

a second heat exchanger for transferring heat to the heat sink from the vaporized discharge fluid that has passed through the expansion device and first heat exchanger; and

a fluid line for carrying to the accumulator fluid that has passed through the second heat exchanger.

25. The system of claim 15, further comprising:

a heat source; and

a second expansion device through which liquid discharge fluid from the accumulator is expanded; and

a third heat exchanger for transferring heat from the heat source to the discharge fluid that has passed through the second expansion device; and

a second fluid line for carrying to the boiler at least a portion of the liquid discharge fluid that has passed through the third heat exchanger.

26. The system of claim 15, further comprising:

a heat source; and

a second expansion device through which liquid discharge fluid from the accumulator is expanded;

a third heat exchanger for transferring heat from the heat source to the discharge fluid that has passed through the second expansion device; and

a second fluid line for carrying to the boiler at least a portion of the liquid discharge fluid that has passed through the third heat exchanger; and

a third fluid line for carrying to the accumulator fluid that has passed through the third heat exchanger.

27. A method for producing power to drive a load using a working fluid circulating through a system that includes a prime mover having an inlet, an accumulator containing discharge fluid from the prime mover, the method comprising the steps of:

expanding a high velocity stream of heated vaporized fluid at relatively high pressure through the prime mover to a lower pressure discharge side of the prime mover, such that fluid exiting the prime mover is condensed without transferring heat of the vapor to an external heat sink;

vaporizing the discharge fluid;

transferring latent heat of condensation from discharge fluid discharged from the prime mover to vaporized discharge fluid;

heating vaporized discharge fluid to which heat has been transferred from fluid discharged from the prime mover; and

returning the heated vaporized fluid to the prime mover inlet.

28. The method of claim 27, wherein the step of vaporizing the discharge fluid further comprises:

vaporizing the discharge fluid by passing the discharge fluid through an expansion device across a pressure differential to a lower pressure than the pressure at the prime mover discharge side; and

transferring latent heat of condensation from discharge fluid being discharged from the prime mover to the discharge fluid that has passed through the expansion device;

29. The method of claim 27, wherein the step of vaporizing the discharge fluid further comprises:

maintaining the prime mover discharge at the relatively lower pressure by pumping vaporized discharge fluid discharged from the prime mover to the prime mover inlet.